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Eco-friendly policies and financial performance: Was the financial crisis a game changer for large US companies?☆

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ABSTRACT

Whether companies implementing eco-friendly policies are better immune to negative shocks in financial performance during crisis times and perform differently after the shocks remains an open question. We gather information on firms' CSR performance from the Bloomberg ESG Database, which contains environmental, social, and governance measures for thousands of companies. We build a panel dataset of large US caps included in the S&P 500 index between fiscal year 2005 and 2017. Controlling for financial health, social and governance performance, we employ seven proxies for environmental performance and look at both accounting- and market-based financial performance. We find that the existence of emission reduction or climate change policies in large US companies does not seem to be broadly associated with financial performance. Whether or not we condition the analysis on the occurrence of the 2008–2009 financial crisis, we do not observe clear-cut changes over time. Overall, we find weak evidence supporting the hypothesis that the relation between financial performance and environmental performance is specific to periods of low trust.

1. Introduction

The adoption of environmentally-friendly practices by private companies has become more widespread in the past few years. Etsy and Lubin (2010) define the implementation of these strategies focusing on sustainability as a "megatrend". They refer to it as being intrinsically related to the need for achieving a competitive edge in a world where resources have become even more coveted.

Pressure from consumers is also a motive for companies to redesign their environmentally-friendly practices. To respond to this pressure, companies have to offer green alternatives in both their production methods and their products themselves. According to Vandermerwe and Oliff (1990), the increase in eco-friendly behaviors seems to have shifted consumers' decisions and habits. They conclude that the capacity of firms to adopt eco-friendly behaviors durably influences consumers' choices.

Environmental performance is one of three pillars of firms' CSR ratings, which also depend on social and governance performance. CSR ratings are in fact determined according to the intensity of activities by which firms build social capital. La Porta et al. (1997, p. 333) view social capital as the "propensity of people in a society to cooperate to produce socially efficient outcomes" and highlight "the norms of reciprocity and trustworthiness" that arise from connections among individuals. In the definition of CSR cited in Servaes and Tamayo (2013), "CSR is the commitment of a business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve the quality of life." It is therefore not surprising that CSR intensity is used to measure social capital in several papers. For example, Lins et al. (2017) measure investment in social capital by CSR intensity and see it as an "insurance policy that pays off when investors and the economy at large face a severe crisis of confidence and when the reward for being identifiably trustworthy increases markedly". They highlight "an enhanced insurance benefit of CSR that goes beyond the notion that CSR acts as insurance against idiosyncratic firm-specific legal risk".

Going green in particular sends a signal to the investors that the company aims to build social capital by taking into account the pollution externalities and trying to adopt sustainable behaviors. Following the logical reasoning of the signaling theory, this should have an impact on the financial performance of the firm. From a shareholder perspective, if investors perceive firms with high social capital through enhanced environmental performance as more trustworthy, they may place a valuation premium on these firms especially when overall trust in companies is low, as in the 2008–2009 financial crisis (Guiso et al., 2008).

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There are few studies about the relationship between CSR and financial performance in times of crisis. This is particularly true when we zoom in on eco-friendly policies. To the best of our knowledge, no paper directly addresses the link between environmental performance and financial performance before, during, and after the Great Financial Crisis (GFC). On the one hand, if the argument of an enhanced insurance benefit of CSR is correct, firms with enhanced environmental performance should enjoy a higher value premium and higher financial performance during crisis times. Stakeholders would be more willing to help high-social-capital firms weather a crisis, given that such firms displayed greater cooperation with stakeholders in the past. On the other hand, investors may consider CSR investments in environmental stewardship as a waste of money in circumstances where firms should focus exclusively on economic survival and their day-to-day business operations. Determining the nature of the relationship between environmental and financial performance in times of crisis is therefore of prime importance for strategic decisions, since it could influence the pursuit of sustainable environmental practices by companies.

We gather information on firms' CSR performance from the Bloomberg ESG Database, which contains environmental, social, and governance measures of large publicly traded companies. We build a panel dataset of 58 firms included in the S&P 500 index and observed between fiscal year 2005 and 2017. As it is difficult to choose variables that best describe the financial outcomes of a company's operations, financial performance is measured by the profit margin, return on assets (ROA), earnings per share (EPS), price to book value, and stock returns. It is also important to note that the financial crisis was sudden enough to constitute a natural experiment during which levels of CSR remain fixed in the short term, allowing us to study how the valuation of firms changed as a function of their CSR intensity in crisis times.

2. Literature review

Before determining the different behaviors that companies may adopt towards CSR in times of crisis, the expression of CSR needs to be clearly defined. CSR is often defined as the consideration by companies of obligations within society beyond profit-making for shareholders. In spite of the simplicity of this short definition, the scope of CSR remains unclear. More than dozens of definitions exist, each taking a different aspect of "responsibility" into account. In this paper, we focus on one aspect of corporate responsibility: its environmental dimension.

CSR now plays an integral role in a company's strategy. In recent years, companies have been increasingly incentivized to behave more ethically, to disclose their practices, and to gain from a better reputation, which could be financially rewarding.

For example, Pava and Krausz (1996) conclude that corporate social responsibility is positively correlated with financial performance. They gather >106 firms divided in two sample groups, with group 1 including CSR performant firms and group 2 used as a control group. The study covers two periods, from 1985 to 1987 and from 1989 to 1991. They conclude that "firms which have been perceived as having met social-responsibility criteria have generally been shown to have financial performance at least on a par, if not better, than other firms".

Stanwick and Stanwick (1998) find similar results. They analyze firms between 1987 and 1992, which were included at that time in the Fortune Corporate Reputation Index and in the top 500 companies in terms of pollution emissions as measured in the United States Environmental Protection Agency (EPA)'s Toxic Release Inventory Report. The sample ranges from 102 and 120 firms depending on the year of interest. They measure Corporate Financial Performance (CFP) by profitability measures and Corporate Social Performance (CSP) by the Corporate Reputation Index and the EPA report. They find that there is a significant positive correlation between CSP and profitability in normal times.

Chetty et al. (2015) investigate the impact of CSR on corporate financial performance in South Africa. The analysis covers various industries and provides mixed results between CSR and CFP over the long term. Based on these results, they find that CSR activities lead to no significant differences in financial performance.

In a large review of >150 academic articles, Peloza (2009) estimates that most of the studies "show a positive relationship between CSP and financial performance (63%)" with only "15% of studies report[ing] a negative relationship, and 22% report[ing] a neutral or mixed relationship". However, "the relationship is relatively weak" and that "questions of causality are unanswered" (Peloza, 2009). In addition, the incentives to comply to CSR guidelines may not be enough in times of crisis during which managers may exclusively attempt to cut costs and preserve the company's financial health. Companies are torn between preserving CSR and focusing on the profit dimension only. According to the traditional shareholder perspective, the main goal of a company is to maximize profit, within the limits of regulations and generally accepted ethical behaviors. This means that managers may disregard CSR in times of crisis to a larger extent than in normal circumstances. However, this short-term reaction may also turn out to be counterproductive ultimately, as the implementation of costly environmental policies may boost innovation and lower costs in the medium term.

The literature on how companies change their CSR attitude and strategy in times of crisis is still very limited. In most papers, the occurrence of crises is found to be detrimental to the CSR activities. For example, Souto and Fernández (2009) see financial crises as signals to stop investing in CSR to survive the financial shock, at least momentarily. Njoroge (2009) focuses on the effects of financial crisis on CSR initiatives in Kenya. The study deals with foreign multinational companies in Kenya, with data collected from phone interviews of senior executives found on the registrar of companies in Kenya, and from the Covalence database. Results show a clear trend in decreasing the CSR initiatives in times of crisis. The main effect of the crisis on CSR is the cuts in social programs previously set by the companies. According to Njoroge (2009), these "stalling of the projects, postponement, or cancellation" can be attributed to the "global credit crunch". Labor standards also suffer since downsizings were used to enable the company to survive the "adverse effects" of the crisis. Companies could even also use technicalities in the Kenyan Labor Code to reduce their labor costs and bypass some ethical concerns for labor conditions.

Karaibrahimoğlu (2010) find similar results, which are based on a random sample of 100 companies chosen from the Fortune 500 list. The analysis shows that there was a significant drop in the number and extent of CSR projects during the financial crisis, precisely at times where demand for social projects was higher than otherwise. Other studies confirm these results.

According to Jacob (2012), massive layoffs and expenditure cuts on community involvement programs were the most obvious outcomes of the crisis. He also insists on the pressures companies face to keep their business going. This would be the main reason for a general degradation of CSR standards and practices by businesses in times of crisis.

Finally, using a sample of 1666 U.S. companies from 2003 to 2009, Bansal et al. (2015) show that most companies decide to opt out of CSR investments in times of crisis, or to divest from them, while a minority of companies does the opposite. Interestingly, they distinguish "tactical commitments" from "strategic commitments" in CSR activities. They argue that only tactical CSR would show signs of decline because it is not integrated into the daily operations of a company. In contrast, strategic CSR measures are integrated into the company's activities, which make them harder to push away.

Based on a sample of 112 companies, 90% of them being European and American firms, Giannarakis and Theotokas (2011) even point to increased CSR performance before and during the financial crisis except for the period 2009–2010. Contrary to the above-cited studies, they

argue that companies increase their CSR performance in order to regain the lost trust in businesses.

A related question is to ask whether good CSR performance is financially rewarding in crisis times. For example, Selvi et al. (2010) find a positive and significant relationship between CSR and CFP before and during the financial crisis era. Their sample includes 26 companies figuring in a survey on firm reputation in Turkey, with two different periods being identified: before the financial crisis (2005–2006) and during the financial crisis (2008–2009). There is nevertheless no statistical difference between the two periods, which is explained by the good reputation built by these companies ahead of the crisis, rendering useless or counterproductive any CSR policy change during the financial shock.

Simionescu and Dumitrescu (2014) analyze companies from the Bucharest Stock Exchange (BSE) between 2006 and 2012, on which 19 companies meet the criteria for CSR (out of 67 or 68 companies depending on the year of observation). They conclude that a good CSR performance has a positive impact on financial performance in times of crisis. CSR has a statistically significant positive impact on two accounting-based measures of financial performance: Return on Equity (ROE) and Return on Assets (ROA).

Lins et al. (2017) use a sample of 1673 non-financial firms, over a period going from 2006 to 2013. Controlling for numerous factors, they find that returns are higher for firms with high CSR performance, relatively to firms with low CSR performance. They argue that the good financial performance may come from CSR initiatives being valued as trustworthy by the stakeholders in a period characterized by a low level of trust.

Some studies come to less rosy conclusions. Based on years 2008 through 2011, Simionescu and Gherghina (2014) investigate the link between CSR and CFP, including both accounting-based performance and market-based measures, such as earning per shares, price/earnings ratio, or price/book ratio. They do not find a statistically positive relationship between CSR and most of the financial performance measures. They identify a significant negative relationship between CSR and return on sales. When it comes to market-based ratios, only the relationship between CSR and earnings per share (EPS) is significant and positive.

Hirigoyen and Poulain-Rehm (2015) examines the causal relationships between CSR and financial performance, based on a sample of 329 listed companies in three geographical areas (the United States, Europe and the Asia-Pacific region) for the years 2009 and 2010. The results show not only that greater social responsibility does not result in better financial performance, but also that financial performance negatively impacts corporate social responsibility.

As the environmental dimension is often neglected when referring to CSR, we zoom in on the link between financial performance and environmental performance for large US companies. In Gallego-Álvarez et al. (2015), the focus is strictly on carbon emission reduction. They use international data consisting of 89 companies for the period 2006–2009. They conclude that a reduction in emissions generates a positive impact on financial performance. There is also Hart and Ahuja (1996) who show that it does pay to be green in normal market circumstances. They estimate strong correlations between the reduction in emissions of greenhouse gases and the financial performance of a company. According to their results, both the operating performance (return on sales and return on assets) and the return on equity increase as the emissions decrease.

The focus of our paper is to test the subsistence, or not, in times of crisis of such a relationship between financial performance and all the key eco-friendly policies implemented by large caps in the US, controlling for additional factors and going beyond the reduction in greenhouse gas emissions.

3. Data

The sample includes companies belonging to the S&P 500 index, as in Ilinitch et al. (1998), Konar and Cohen (2001), and Al-Tuwaijri et al. (2004). Since the financial crisis started in the USA, it seems natural to focus on US-based firms. In addition, even though the 2008 Subprime crisis was a global crisis, it did not spread throughout the world uniformly. Therefore, we avoid any misrepresentation or lead-lag effect in our results by focusing on US companies only. As the S&P 500 represents a large sample of US companies and all sectors are included in it, financial performance is more easily accessible and more accurately measured. It is also more likely to find ESG data on large market capitalizations than on small or medium-sized companies. We nevertheless follow Konar and Cohen (2001) who eliminate financial institutions as being non-polluting industries by nature. In addition, banks have significant off-balance sheet operations, which may introduce a bias in the measurement of the true levels of total assets and liabilities.

Contrary to Al-Tuwaijri et al. (2004) and Ilinitch et al. (1998), we do not focus on chemical toxic releases only but we instead center our paper ESG disclosures and policies for sustainable productions, as provided by the Bloomberg ESG Database.[1] For each year in the period 2005–2017, the following eight environmental performance indicators are collected.

- *Environment Disclosure Score* (*EDS*). It goes from 0.1 (minimum disclosure) to 100 (maximum disclosure). This score depends on the following criteria.
- *Verification Type* (*VT*). It indicates whether the company's environmental policies were subject to an independent audit for the reporting period (1) or not (0).
- *Total Greenhouse Gases Emissions* (*TGGE*). It is defined as the sum of total greenhouse gases emissions (methane, carbon dioxide, nitrous oxide, water vapor). The units are expressed in millions of metric tons.
- *Climate Change Policy* (*CCP*). It indicates whether the company communicates on its effort to reduce its footprint and to improve its sustainability (1) or not (0).
- *Emission Reduction Initiatives* (*ERI*). It indicates whether the company has carried out actions to reduce its Greenhouse Gas Emissions (1) or not (0).
- *Green Building Policy* (*GBP*). It indicates whether the company has carried out policies in aiming at reducing its building's footprint (1) or not (0).
- *Environment Quality Management* (*EQM*). It indicates whether the company has carried out actions aiming at reducing its operations' footprint (1) or not (0).
- *Energy Efficiency Policy* (*EEP*). It indicates whether the company has carried out actions aiming at efficiently using energy (1) or not (0).

For each firm in the sample, we therefore have the eight above-listed proxies for environmental performances. We control for social and governance performance by using two additional variables provided by Bloomberg ESG data: *Social Disclosure Score* (*SDS*, from 0.1 to 100) and *Governance Disclosure Score* (*GDS*, from 0.1 to 100 as well).[2] The

[1] Bloomberg ESG data is collected from company-sourced filings such as Corporate Social Responsibility reports, annual reports, company websites and a proprietary Bloomberg survey that requests corporate data directly. Bloomberg has researched 20,000 companies worldwide across >50 countries, covering virtually the entire investable universe that disclose ESG data. None of this data is estimated or derived; every data field has transparency back to a company document. This data is checked and standardized. Bloomberg ESG data covers 120 environmental, social and governance indicators including: carbon emissions, climate change effect, pollution, waste disposal, renewable energy, resource depletion, supply chain, political contributions, discrimination, diversity, community relations, human rights, cumulative voting, executive compensation, shareholders' rights, takeover defense, staggered boards, and independent directors. Bloomberg ESG rating will penalize companies for "missing data."

[2] Social performance depends on the quality of the supply chain management, discrimination policies, political contributions, diversity policies, human rights protection, and community relations. Governance performance depends on policies in terms of cumulative voting, executive compensation, shareholders' rights, takeover defense, staggered boards, and independent directors.

combination of *EDS*, *SDS*, and *GDS* gives the overall *ESG* score (from 0.1 to 100) provided by Bloomberg.

We also collect financial data from the annual reports on Bloomberg to assess financial performance. Our financial performance measures (*FPM*) include two accounting-based metrics, i.e., *Return on Assets* (*ROA*) and *Profit Margin* (*PM*), and three market-based indicators, i.e. *Stock Returns* (*SR*), *Earnings per Share* (*EPS*) and *Price to Book ratio* (*PB*).

Because other firm characteristics may matter for financial performance, we also control for size (estimated by the log of market capitalization, *LnMktCap*), leverage (estimated by *Total Debt*), liquidity (estimated by *Cash Holdings*, *Current Ratio*, or *Account Receivables in % of total assets*), innovation (*R&D Expenditures to Cash Flows*), and profitability (estimated by *Operating Margin*). The use of these proxies to measure a firm's financial health is important since ESG scores are likely to be correlated with a firm's capacity to withstand a downturn in the economy. We also add a dummy for firms with a *Negative EBITDA-to-Revenues* ratio, because such firms are likely distressed and their financial performance may be more like those of high book-to-market firms than low book-to-market firms (see Lins et al., 2017). When financial performance is estimated by *ROA*, *PM*, *SR*, and *EPS*, we also control for the *Price-to-Book ratio* (*PB*). Finally, *Momentum* is captured by the firm's raw return over the last year.

Out of the 500 firms in the S&P 500 index, we were able to collect all the above-mentioned variables for 58 firms over a time period of 13 years, leading to a panel dataset of 754 observations. In other related studies, the samples ranges from around 20 companies (Simionescu and Dumitrescu, 2014; Selvi et al., 2010) to around 60 (Simionescu and Gherghina, 2014) and up to 120 (Giannarakis and Theotokas, 2011; Stanwick and Stanwick, 1998; Pava and Krausz, 1996). In comparison to broader studies such as Lins et al. (2017), the sample size is smaller since *detailed environmental* data remain scarce and companies face different mandatory disclosure obligations depending on the industry. As in Lins et al. (2017) who use monthly data, we define the financial crisis as the period covering two years, i.e., 2008 and 2009.[3] We also define a pre-crisis period covering the years 2005 to 2007 and a post-crisis period going from 2010 to 2017.

To ensure that the variables are not highly correlated between themselves and avoid the multicollinearity issue, Table 1 reports the correlation matrix. Results show that there is no indication of multicollinearity and therefore that the risk of a type II error would be low in a regression analysis, since the highest correlation coefficient among explanatory variables is equal to 0.65, between *Cash Holdings* and *Total Debt* to be precise. It also ensures that the goodness of fit of the model will not be inflated by the potential overfit that multicollinearity could lead to.

Descriptive statistics are reported in Table 2. The average profit margin in our sample is 10.74%. Return on asset is 7.41% on average and the average earnings per share is $3.58. We see that the price-to-book ratio exhibits the highest level of skewness. This suggests that the sampled companies have disparate types of firms, including both growth-oriented and value-oriented companies. Several variables display a high level of kurtosis, which often explains why the null hypothesis of normality under the Jarque-Bera test is rejected except for the three *ESG Score* variables at 5%. The highest level of kurtosis is in fact displayed by *P_Book*, pointing to a leptokurtic distribution with fat tails and meaning that there are more firms with low and/or high market capitalization to book values than the normal distribution would imply. Nevertheless, given the size of the panel dataset and assuming no omission bias, the consistency of the coefficient estimators is expected.

When looking at the proxies for environmental performance, a majority of firms seem to have implemented at least some environmental policies. On average between 2005 and 2017, 65% of the observations denote the presence of a climate change policy, 89% of an emission reduction policy, 87% of an energy efficiency policy, and about 68% of environmental quality management.

The eco-friendly trend evoked in the preceding section is clearly identified in our data sample. In 2006, an average of 2% of the companies had independent audits on their green practices, while in 2016 the average went up to 53%. In the meantime, climate change policy went from an average of 41% in 2006 to 83% in 2016, emission reduction policy from 57% to 100%, green building policy from 16% to 64%, environmental quality management from 36% to 81%, and energy efficiency policy from 53% to 97%. This represents an average increase of 45 percentage points in green policies from 2006 to 2017. Between 2006 and 2012, the average increase was still 36 percentage points, in contrast to the estimated decreasing trend in CSR practices in times of crisis found in Njoroge (2009), Karaibrahimoğlu (2010), and Jacob (2012).

4. Empirical results

Table 3 present results of estimating the following panel regression models using the five financial performance measures (*FPM*) described in the preceding section.

$$FPM_{i,t} = b_0 + b_1 ESG_{i,t-1} + \boldsymbol{b_2'X_{i,t-1}} + Time\ Dummies + Firm\ Fixed\ Effects + e_{i,t} \quad (1)$$

$$FPM_{i,t} = b_0 + b_1 EDS_{i,t-1} + b_2 SDS_{i,t-1} + b_3 GDS_{i,t-1} + \boldsymbol{b_4'X_{i,t-1}} + Time\ Dummies + Firm\ Fixed\ Effects + e_{i,t} \quad (2)$$

$$FPM_{i,t} = b_0 + b_1 VT_{i,t-1} + b_2 TGGE_{i,t-1} + b_3 CCP_{i,t-1} + b_4 ERP_{i,t-1} + b_5 GBP_{i,t-1} + b_6 EQM_{i,t-1} + b_7 EEP_{i,t-1} + b_8 SDS_{i,t-1} + b_9 GDS_{i,t-1} + \boldsymbol{b_{10}'X_{i,t-1}} + Time\ Dummies + Firm\ Fixed\ Effects + e_{i,t} \quad (3)$$

where the set of control variables $\boldsymbol{X_{i,t-1}}$ include: *R&D Expenditures to Cash Flows*, *Current Ratio*, *Account Receivables in % of Total Assets*, *Total Debt in % of Total Assets*, *Ln*(*MktCap*), *Operating Margin*, *Negative EBITDA-to-Revenues* (1/0), *Price-to-Book ratio*, and *Momentum*. We also include the first lag of the dependent variable to control for autocorrelation. Models (1) to (3) are estimated over the whole 2005–2017. *Time Dummies* are specified at the annual level and *Firm Fixed Effects* control for time-invariant omitted risk factors.[4] All standard errors are clustered at the firm level.[5] As an alternative to *Firm Fixed Effects*, we use *Industry dummies* (defined at the two-digit SIC level) since some industries may indeed be more likely to invest in CSR than others. These industries may also have been differentially affected by the financial crisis.[6]

[3] The NBER based Recession Indicator for the United States also point to a recession between January 2008 and June 2009.

[4] Before performing these regressions, we conducted several tests to determine the nature of the fixed effects in the panel data. Following the methodology of Croissant and Millo (2008), we perform Lagrange multiplier tests. We conducted a Breusch-Pagan type test to determine the presence of cross-section or time effects. We also performed a Gourieroux, Holly, and Monfort type test to check the presence of both cross-section and time effects at the same time. The tests are available upon request. When the null of redundancy was not rejected, the redundant fixed effects were removed from the model. After checking for fixed effects, we also conducted the test by Hausman to choose between a fixed effects model and a random effects model (Croissant and Millo, 2008). Results not reported to save space but random effects models were inconsistent in every case. Finally, a Chow F-test was also performed to assess the poolability of our panel data, and ensure that classical panel data models were applicable instead of mixed-effects models. The pooled model was inappropriate in every case.

[5] We obtain virtually identical significance levels if we double cluster standard errors by firm and time period.

[6] Results are qualitatively similar in both cases. They are available upon request. Although adjusted R-squared were lower when we included industry dummies, the estimated coefficient covariance matrix was never of reduced rank, which is desirable for robustness.

Table 1
Correlation analysis.

	Total GHG Emissions	Verification Type	Climate Change Policy	Emission Reduction Policy	Green Building Policy	Environment Quality Mgmt	Energy Effic. Policy	Governance Score	Environement Score	Social Score	*Ln*(*Market Cap*)	Total Debt	Cash Holdings	Operating Margin	Price to Book	Neg. EBITDA to Revenues	Momentum
Total GHG Emissions	1.000000 –																
Verification Type	−0.010468 0.7935	1.000000 –															
Climate change Policy	−0.006436 0.8721	0.153378 0.0001	1.000000 –														
Emission Reduction Policy	−0.007268 0.8558	0.158212 0.0001	0.414913 0.0000	1.000000 –													
Green Building Policy	−0.227018 0.0000	0.179485 0.0000	0.206331 0.0000	0.305257 0.0000	1.000000 –												
Environment Quality Mgmt	−0.076159 0.0565	0.252705 0.0000	0.286718 0.0000	0.388767 0.0000	0.139202 0.0005	1.000000 –											
Energy Effic. Policy	−0.171183 0.0000	0.201871 0.0000	0.314923 0.0000	0.681472 0.0000	0.341446 0.0000	0.415414 0.0000	1.000000 –										
Governance Score	0.118039 0.0031	0.575761 0.0000	0.354366 0.0000	0.385237 0.0000	0.243519 0.0000	0.284022 0.0000	0.318959 0.0000	1.000000 –									
Environement Score	−0.053015 0.1846	0.411498 0.0000	0.425301 0.0000	0.473724 0.0000	0.281804 0.0000	0.468015 0.0000	0.450323 0.0000	0.588216 0.0000	1.000000 –								
Social Score	0.021286 0.5944	0.357969 0.0000	0.304060 0.0000	0.405437 0.0000	0.245286 0.0000	0.415140 0.0000	0.380972 0.0000	0.564604 0.0000	0.593081 0.0000	1.000000 –							
Ln(*Market Cap*)	−0.293064 0.0000	0.195727 0.0000	0.375409 0.0000	0.218298 0.0000	0.179816 0.0000	0.058278 0.1446	0.305645 0.0000	0.231479 0.0000	0.208141 0.0000	0.048836 0.2217	1.000000 –						
Total Debt	−0.099953 0.0122	0.019257 0.6300	0.143334 0.0003	0.066709 0.0949	−0.027957 0.4843	−0.070035 0.0795	0.093229 0.0195	0.086242 0.0307	−0.036607 0.3597	0.043583 0.2755	0.364687 0.0000	1.000000 –					
Cash Holdings	−0.198755 0.0000	0.105779 0.0080	0.177419 0.0000	0.103253 0.0096	0.088980 0.0258	0.023294 0.5601	0.131572 0.0009	0.147852 0.0002	0.123446 0.0019	0.091809 0.0214	0.509058 0.0000	0.648510 0.0000	1.000000 –				
Operating Margin	−0.014790 0.7115	0.123032 0.0020	−0.035296 0.3772	−0.018574 0.6422	0.082792 0.0381	0.014183 0.7228	0.029096 0.4667	0.048057 0.2291	0.046927 0.2403	0.021168 0.5965	0.225504 0.0000	−0.043978 0.2712	0.085124 0.0329	1.000000 –			
Price to Book	−0.032029 0.4230	0.157680 0.0001	0.053151 0.1834	0.016714 0.6759	0.086459 0.0303	0.061032 0.1266	0.026031 0.5149	0.125620 0.0016	0.126695 0.0015	0.104471 0.0088	0.119389 0.0027	−0.013634 0.7331	−0.033908 0.3963	0.004605 0.9083	1.000000 –		
Neg. EBITDA to Revenues	−0.043648 0.2748	−0.029976 0.4533	0.022822 0.5681	0.039583 0.3220	0.000724 0.9856	0.016695 0.6763	0.000814 0.9838	0.008455 0.8325	0.015565 0.6971	−0.030550 0.4447	−0.065816 0.0994	−0.018961 0.6353	−0.022063 0.5810	−0.484579 0.0000	−0.020276 0.6120	1.000000 –	
Momentum	0.013945 0.7272	−0.135979 0.0006	−0.129711 0.0011	−0.161669 0.0000	−0.170326 0.0000	−0.101293 0.0111	−0.162694 0.0000	−0.207428 0.0000	−0.195860 0.0000	−0.178751 0.0000	0.018536 0.6429	−0.016380 0.6820	−0.058090 0.1459	0.041677 0.2970	0.012236 0.7596	−0.031943 0.4242	1.000000 –

Correlation coefficients are given in the first row and the p-values are given in the second row.

Table 2
Descriptive statistics.

	RETURN_ON_ASSET	PROF_MARGIN	EPS	P_BOOK	STOCK_RETURNS	VERIF_TYPE	TOT_GHG_CO2_EM	ENV_SCORE	GOV_SCORE	SOC_SCORE
Mean	7.414761	10.74482	3.574971	4.597721	13.57360	0.242921	274.6533	38.40084	61.96188	37.57335
Median	7.284842	10.14278	3.132915	3.085480	9.087951	0.000000	106.3964	38.31861	62.50000	38.59649
Maximum	35.08447	56.42280	19.31933	245.6976	357.2986	1.000000	3572.737	82.17054	85.71429	85.96491
Minimum	−21.55312	−128.5778	−13.09000	0.459410	−72.38155	0.000000	22.03673	2.068966	25.00000	3.125000
Std. Dev.	5.711135	11.49558	2.764952	10.83647	36.52665	0.429168	433.8701	15.25216	7.271876	15.74220
Skewness	−0.025144	−3.655132	1.597630	16.59517	3.021253	1.198929	3.578052	0.058523	0.041741	−0.131720
Kurtosis	6.082949	41.25532	10.76438	343.5314	23.37924	2.437431	18.48788	2.670116	3.567166	2.534378
Jarque-Bera	298.6815	47,656.25	2208.853	3,619,204.	14,194.84	169.6010	7919.916	3.369391	9.133635	7.942176
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.185501	0.010391	0.018853
Sum	5590.730	8101.593	2688.378	3411.509	10,234.49	163.0000	179,348.6	25,344.55	41,328.57	25,023.85
Sum Sq. Dev.	24,560.65	99,507.67	5741.366	87,014.93	1,004,650.	123.4039	1.23E+08	153,302.0	35,218.20	164,798.2
Observations	754	754	752	742	754	671	653	660	667	666

	CLIM_CHG_POL	EMISSION_REDUC	GREEN_BUILDING	ENVIRON_QUAL_MGT	ENERGY_EFFIC_POL	MKTCAP	TOTAL_DEBT	CURR_RATIO	AR_TA	RD_EXP_PER_CASH_FLOW
Mean	0.653846	0.887407	0.511111	0.680473	0.870920	61,653.74	17,795.05	1.593673	0.488262	0.353480
Median	1.000000	1.000000	1.000000	1.000000	1.000000	36,840.35	7843.000	1.402099	0.470327	0.281551
Maximum	1.000000	1.000000	1.000000	1.000000	1.000000	382,421.0	523,762.0	5.575404	1.578728	16.97934
Minimum	0.000000	0.000000	0.000000	0.000000	0.000000	1565.787	0.000000	0.275212	−0.485082	−22.45902
Std. Dev.	0.476095	0.316329	0.500247	0.466638	0.335538	64,277.01	48,190.95	0.740580	0.223574	1.273109
Skewness	−0.646762	−2.451215	−0.044455	−0.774077	−2.212541	1.788256	7.687684	1.629559	0.665728	−3.221770
Kurtosis	1.418301	7.008457	1.001976	1.599195	5.895338	6.555201	67.80262	7.411722	5.426934	204.7926
Jarque-Bera	117.5951	1127.856	112.5001	122.7795	785.3316	796.8346	139,357.5	945.1747	240.7391	1,192,281.
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	442.0000	599.0000	345.0000	460.0000	587.0000	46,363,615	13,417,466	1201.629	368.1496	248.1426
Sum Sq. Dev.	153.0000	67.44296	168.6667	146.9822	75.77003	3.10E+12	1.75E+12	412.9892	37.63880	1136.185
Observations	676	675	675	676	674	752	754	754	754	702

RETURN_ON_ASSET is the return on assets (in %). *PROF_MARGIN* is the profit margin (in %). *EPS* is the annual earnings per share. *P_BOOK* is the price-to-book ratio. *STOCK_RETURNS* is the annual stock returns (in %). *VERIF_TYPE* is a binary variable (*Verification Type*) indicating whether an independent audit on CSR disclosures was led. *TOT_GHG_CO2_EM* is the total greenhouse gases emissions defined as the sum of total greenhouse gases emissions (methane, carbon dioxide, nitrous oxide, water vapor), in millions of metric ton. *ENV_SCORE* is the *Environmental Disclosure Score* (from 0.1 to 100). *GOV_SCORE* is *Governance Disclosure Score* (from 0.1 to 100). *SOC_SCORE* is *Social Disclosure Score* (from 0.1 to 100). *CLIM_CHG_POL* is a binary variable (*Climate Change Policy*) indicating whether the company communicates on its effort to reduce its footprint and to improve its sustainability. *EMISSION_REDUC* is a binary variable (*Emission Reduction Initiatives*) indicating whether the company has carried out actions to reduce its Greenhouse Gas Emissions. *GREEN_BUILDING* is a binary variable (*Green Building Policy*) indicating whether the company has carried out policies in aiming at reducing its building's footprint. *ENVIRON_QUAL_MGT* is a binary variable (*Environment Quality Management*) indicating whether the company has carried out actions aiming at reducing its operations' footprint. *ENERGY_EFFIC_POL* is a binary variable (*Energy Efficiency Policy*) indicating whether the company has carried out actions aiming at efficiently using energy. *MKTCAP* is the market capitalization in millions of USD. *TOTAL_DEBT* is the total debt in millions of USD. *CURR_RATIO* is the current ratio (in %). AR_TA is account receivables as % of total assets. *RD_EXP_PER_CASH_FLOW* is *R&D Expenditures as a % of Cash Flows*.

Table 3
Eco-friendly policies and financial performance between 2005 and 2017.

	Stock Returns$_{i,t}$	*Earnings Per Share*$_{i,t}$	*Price to Book*$_{i,t}$	*Profit Margin*$_{i,t}$	*Return on Assets*$_{i,t}$
Model (1)					
ESG Score ($ESG_{i,t-1}$)	0.10704	−0.006119	0.125069	0.021211	0.018678
Adjusted R-Squared	0.197426	0.755497	0.282057	0.423068	0.492171
Model (2)					
EDS Score ($EDS_{i,t-1}$)	0.185207	0.00221	0.029422	0.015283	0.012434
SDS Score ($GDS_{i,t-1}$)	−0.136753	−0.002355	0.049706	−0.010735	0.000399
GDS Score ($SDS_{i,t-1}$)	0.024743	−0.016096	0.094799	0.038769	0.006329
Adjusted R-Squared	0.200509	0.754827	0.28148	0.42103	0.486917
Model (3)					
SDS Score ($SDS_{i,t-1}$)	−0.148392	−0.003755	0.06731	0.009198	0.015334
GDS Score ($GDS_{i,t-1}$)	−0.086992	0.005126	0.109401	−0.01774	−0.007527
Verification Type ($VT_{i,t-1}$)	8.228314*	−0.126728	0.541373	2.175349**	0.845463*
Total GHG Emissions ($TGGE_{i,t-1}$)	0.002436	−0.000099	0.000253	0.001296	0.000325
Climate Change Policy ($CCP_{i,t-1}$)	5.797559	−0.219176	−0.256232	−1.165477	−0.328707
Emission Reduction Pol. ($ERP_{i,t-1}$)	9.633751	0.328224	−0.418937	−1.971217	−0.744861
Green Building Policy$_{i,t-1}$ ($GBP_{i,t-1}$)	1.749489	−0.085009	0.566668	0.591357	0.257542
Environment Qual. Mgt ($EQM_{i,t-1}$)	2.113937	0.016919	−0.023115	1.340243	0.132637
Energy Efficiency Policy ($EEP_{i,t-1}$)	−5.121314	0.185754	−1.916325	−1.211553	−0.953057
Adjusted R-squared (%)	0.216925	0.800319	0.270059	0.418199	0.471212

*/**/*** indicate p-values < 0.10/0.05/0.01 respectively. The set of control variables include the first lagged values of: *R&D Expenditures to Cash Flows*, *Current Ratio*, *Account Receivables in % of Total Assets*, *Total Debt in % of Total Assets*, *Ln*(*MktCap*), *Operating Margin*, *Negative EBITDA-to-Revenues* (*1/0*), *Momentum*. We also include the first lag of the dependent variable to control for autocorrelation. All models include *Time Dummies* specified at the annual level and *Industry Fixed Effects* to control for time-invariant omitted industry risk factors. All standard errors are clustered at the firm level. The coefficients estimate for the control variables, the industry and time fixed effects are not reported to save space.

The goal of Model (1) is to test whether *ESG* performance affects financial performance over the whole time period covered in the sample, i.e., from 2005 to 2017. At this stage, we disregard any possible difference in the relation between ESG and financial performances due to the financial crisis. In Model (2), we investigate which of the components of ESG performance matters the most: *Environment Disclosure Score* (EDS), *Social Disclosure Score* (SDS), or and *Governance Disclosure Score* (GDS). In Model (3), we focus mores specifically on *Environment Disclosure Score* (EDS) and split it into the seven components described in the preceding section. We estimate and.

In Table 3, we observe that the link between ESG performance and financial performance over the full time period, i.e., between 2005 and 2017, is very weak. In Model (1), the coefficient sign of *ESG Score* is positive in four cases out of five but the *ESG Score* is never statistically significant. We therefore cannot reject the null hypothesis that the *ESG Score* does not affect any of the five proxies of financial performance.

In Model (2), the decomposition of the *ESG Score* into its three components leads to the same conclusion. All else equal, there is no statistical evidence that a better environmental, social, or governance score is associated with a better financial performance. Coefficient signs for *EDS* and *GDS Scores* are systematically positive but never significant.

The only evidence of a positive ceteris paribus association between ESG and financial performance is found in Model (3). Controlling for social and governance performance among other factors, we see that the only eco-friendly policy that has a significant bearing on financial performance is *Verification Type* (*VT*). All else equal, the fact that an independent audit on their environmental policies is led, is associated with higher stock returns, better profit margins, and high returns on assets. For example, all else equal, large US companies for which an independent audit is led, exhibit ROAs which are 0.85p% higher on average than those for which such an audit is not available, with a risk of Type I error lower than 10%. All else equal, the profit margin is also expected to be on average 2.18p% higher for large caps with an independent audit than for those without any, the Type I error being lower than 5%. Finally, annual stock returns are estimated to be 8.22p% higher all else equal, with a Type I error being lower than 10%.

In conclusion, from 2005 to 2017, we find weak evidence of a link between financial performance and ESG performance, as proxied by Bloomberg's *ESG Score* and its various components.

In Tables 4a and 4b, we further investigate whether the relation between financial performance and ESG performance is specific to periods of low trust, i.e. crises, or is common to most periods, perhaps due to some unobservable risk factor that is correlated with CSR. We estimate a difference-in-differences model with continuous treatment and include firm and time fixed effects. It implies constructing a panel for all the firms in our sample starting in 2005, before the onset of the crisis, and ending in 2017, several years into the economic recovery. Using the same decomposition strategy than before, we obtain:

$$FPM_{i,t} = b_0 + b_1 ESG_{i,t-1} + b_2 ESG_{i,t-1} \times Crisis_t + b_3 ESG_{i,t-1} \times PostCrisis_t + \boldsymbol{b_4' X_{i,t-1}} + Time\ Dummies + Industry\ Dummies + e_{i,t} \quad (4)$$

$$FPM_{i,t} = b_0 + b_1 EDS_{i,t-1} + b_2 SDS_{i,t-1} + b_3 GDS_{i,t-1} + b_4 EDS_{i,t-1} \times Crisis_t + b_5 EDS_{i,t-1} \times PostCrisis_t + b_6 SDS_{i,t-1} \times Crisis_t + b_7 SDS_{i,t-1} \times PostCrisis_t + b_8 GDS_{i,t-1} \times Crisis_t + b_9 GDS_{i,t-1} \times PostCrisis_t + \boldsymbol{b'_{10} X_{i,t-1}} + Time\ Dummies + Industry\ Dummies + e_{i,t} \quad (5)$$

$$\begin{aligned} FPM_{i,t} = {} & b_0 + b_1 VT_{i,t-1} + b_2 TGGE_{i,t-1} + b_3 CCP_{i,t-1} + b_4 ERP_{i,t-1} + b_5 GBP_{i,t-1} + b_6 EQM_{i,t-1} + b_7 EEP_{i,t-1} + b_8 SDS_{i,t-1} \\ & + b_9 GDS_{i,t-1} + b_{10} VT_{i,t-1} \times Crisis_t + b_{11} VT_{i,t-1} \times PostCrisis_t \\ & + b_{12} TGEE_{i,t-1} \times Crisis_t + b_{13} TGEE_{i,t-1} \times PostCrisis_t \\ & + b_{14} CCP_{i,t-1} \times Crisis_t + b_{15} CCP_{i,t-1} \times PostCrisis_t \\ & + b_{16} ERP_{i,t-1} \times Crisis_t + b_{17} ERP_{i,t-1} \times PostCrisis_t \\ & + b_{18} GBP_{i,t-1} \times Crisis_t + b_{19} GBP_{i,t-1} \times PostCrisis_t \\ & + b_{20} EQM_{i,t-1} \times Crisis_t + b_{21} EQM_{i,t-1} \times PostCrisis_t \\ & + b_{22} EEP_{i,t-1} \times Crisis_t + b_{23} EEP_{i,t-1} \times PostCrisis_t \\ & + b_{24} SDS_{i,t-1} \times Crisis_t + b_{25} SDS_{i,t-1} \times PostCrisis_t \\ & + b_{26} GDS_{i,t-1} \times Crisis_t + b_{27} GDS_{i,t-1} \times PostCrisis_t \\ & + \boldsymbol{b'_{28} X_{i,t-1}} + Time\ Dummies + Industry\ Dummies + e_{i,t} \end{aligned} \quad (6)$$

where *Crisis* is a dummy variable set to one in 2008 and 2009. *PostCrisis* is a dummy variable set to one in 2010 to 2017. All the other variables are identical to those used in models (1) to (3).

Table 4a confirms that the link between ESG scores and financial performance is weak, even when we condition the analysis upon the occurrence of the 2008–2009 financial crisis. In Model (4), we only find statistical evidence for the post-crisis period, starting from 2010. All else equal, stock returns and earnings per share are more negatively associated with ESG scores following the financial crisis than before the crisis. In other words, after the crisis (and relatively to the period prior

Table 4a
Eco-friendly policies and financial performance before, during, and after the Financial Crisis.

	Stock Returns$_{i,t}$		*Earnings Per Share*$_{i,t}$		*Price to Book*$_{i,t}$	*Profit Margin*$_{i,t}$	*Return on Assets*$_{i,t}$
Model (4)							
$ESG_{i,t-1}$	0.478591		0.011244		0.01763	−0.038364	−0.033667
$ESG_{i,t-1}$*Crisis*	−0.337496		−0.005974		−0.001456	0.172507	0.127177
$ESG_{i,t-1}$*PostCrisis*	−0.449279	*	−0.023192	**	0.152274	0.057007	0.047994
Adjusted R-Squared	0.196499		0.755592		0.282057	0.424871	0.493827
Model (5)							
$EDS_{i,t-1}$	0.716288		0.009614		−0.02254	−0.035643	−0.033754
$SDS_{i,t-1}$	0.123371		0.015362		0.018373	0.008502	−0.013464
$GDS_{i,t-1}$	1.403622	*	−0.039471		0.050306	−0.034213	0.023456
$EDS_{i,t-1}$*Crisis*	−0.560574		−0.000429		0.003546	0.060119	0.030935
$SDS_{i,t-1}$*Crisis*	−0.229913		−0.000164		0.001757	0.046329	0.097646
$GDS_{i,t-1}$*Crisis*	1.634435	*	−0.010821		−0.016922	0.15316	−0.006141
$EDS_{i,t-1}$*PostCrisis*	−0.585992		−0.009171		0.063255	0.069207	0.061617
$SDS_{i,t-1}$*PostCrisis*	−0.32817	*	−0.024896	*	0.052471	−0.037839	−0.001334
$GDS_{i,t-1}$*PostCrisis*	1.580662	*	0.031686		0.067484	0.056867	−0.032779
Adjusted R-Squared	0.200131		0.755056		0.277325	0.419801	0.490153

*/**/*** indicate p-values < 0.10/0.05/0.01 respectively. The set of control variables include the first lagged values of: *R&D Expenditures to Cash Flows*, *Current Ratio*, *Account Receivables in % of Total Assets*, *Total Debt in % of Total Assets*, *Ln*(*MktCap*), *Operating Margin*, *Negative EBITDA-to-Revenues* (*1/0*), *Momentum*. We also include the first lag of the dependent variable to control for autocorrelation. All models include *Time Dummies* specified at the annual level and *Industry Fixed Effects* to control for time-invariant omitted industry risk factors. All standard errors are clustered at the firm level. The coefficients estimate for the control variables, the industry and time fixed effects are not reported to save space. *ESG* is the combined overall *ESG score* (from 0.1 to 100). *Crisis* is a dummy variable set to one in 2008 and 2009. *PostCrisis is a dummy variable set to one in 2010 to 2017*. *EDS* is the *Environmental Disclosure Score* (from 0.1 to 100). *GDS* is *Governance Disclosure Score* (from 0.1 to 100). *SDS* is *Social Disclosure Score* (from 0.1 to 100).

to the crisis), investors may consider that CSR policies are implemented at the cost of lower future investments in other activities, diminishing the capacity to generate future earnings and harming the market capitalization of the firm.

Model (5) indicates that this conjecture may only hold for the social dimension (*SDS*) of ESG policies, at least with respect to stock returns and earnings per share. This is in contrast to the governance dimension

Table 4b
Eco-friendly policies and financial performance before, during, and after the Financial Crisis.

	Stock Returns$_{i,t}$		*Earnings Per Share*$_{i,t}$		*Price to Book*$_{i,t}$	*Profit Margin*$_{i,t}$		*Return on Assets*$_{i,t}$	
Model (6)									
$SDS_{i,t-1}$	0.026882		0.01569		0.02928	0.004401		0.010369	
$GDS_{i,t-1}$	−0.167517		−0.01598		0.07973	0.095225		0.057529	
$VT_{i,t-1}$	−0.219604		−0.338918		0.432076	−5.124131		−1.483585	
$TGGE_{i,t-1}$	0.00089		0.000621		0.000974	0.002728		0.000963	
$CCP_{i,t-1}$	3.414982		0.141209		0.092005	0.910366		0.964638	
$ERP_{i,t-1}$	0.024578		0.609843		−0.960833	−1.937462		−1.324922	
$GBP_{i,t-1}$	2.130714		0.393234		−0.380625	0.437692		0.250579	
$EQM_{i,t-1}$	1.767329		0.414044	*	−1.143379	0.231228		−0.450697	
$EEP_{i,t-1}$	−3.651484		0.993004	**	0.247365	−2.966339		−2.162652	
$SDS_{i,t-1}$*Crisis*	−0.035236		−0.001022		−0.019625	0.063199		0.085449	
$GDS_{i,t-1}$*Crisis*	1.933887	*	0.016924		0.018047	−0.043374		−0.114299	
$VT_{i,t-1}$*Crisis*	1.260349		−1.325068		−1.788686	9.289599		5.802576	
$TGGE_{i,t-1}$*Crisis*	−0.00179		−0.000594		−0.000484	−0.003458		−0.002997	
$CCP_{i,t-1}$*Crisis*	−2.107161		−0.040832		0.041904	0.684813		−0.654235	
$ERP_{i,t-1}$*Crisis*	1.59277		−0.925204		−0.01648	0.077876		1.079319	
$GBP_{i,t-1}$*Crisis*	−2.511465		−0.51488		−0.283751	1.977657		0.867284	
$EQM_{i,t-1}$*Crisis*	−2.970613		−0.616631		0.876114	−2.138816		0.001599	
$EEP_{i,t-1}$*Crisis*	3.381282		1.588591	**	−1.654978	−0.27595		0.573336	
$SDS_{,t-1}$*PostCrisis*	−0.051235		−0.027261	*	0.057021	−0.008069		−0.012041	
$GDS_{i,t-1}$*PostCrisis*	0.168254	*	0.025164		0.058444	−0.146876		−0.089531	
$VT_{i,t-1}$*PostCrisis*	1.11298	*	0.37411		−0.145807	7.372057	***	2.454889	*
$TGGE_{i,t-1}$*PostCrisis*	−0.000818		−0.00086		−0.000706	−0.001242		−0.000616	
$CCP_{i,t-1}$*PostCrisis*	−3.537929		−0.480563		−0.44579	−3.130676		−1.677137	
$ERP_{i,t-1}$*PostCrisis*	2.180419	*	−0.035804		1.048469	−1.630843		2.512261	
$GBP_{i,t-1}$*PostCrisis*	−1.932057		−0.489623		1.207356	−0.178008		−0.200595	
$EQM_{i,t-1}$*PostCrisis*	−1.51573		−0.393711		1.412605	1.633773		0.647259	
$EEP_{i,t-1}$*PostCrisis*	2.523964		0.792106		−2.452082	3.351054		1.423184	
Adjusted R-squared (%)	0.229766		0.801404		0.244976	0.418199		0.47347	

*/**/*** indicate p-values < 0.10/0.05/0.01 respectively. The set of control variables include the first lagged values of: *R&D Expenditures to Cash Flows*, *Current Ratio*, *Account Receivables in % of Total Assets*, *Total Debt in % of Total Assets*, *Ln*(*MktCap*), *Operating Margin*, *Negative EBITDA-to-Revenues* (*1/0*), *Momentum*. We also include the first lag of the dependent variable to control for autocorrelation. All models include *Time Dummies* specified at the annual level and *Industry Fixed Effects* to control for time-invariant omitted industry risk factors. All standard errors are clustered at the firm level. The coefficients estimate for the control variables, the industry and time fixed effects are not reported to save space. *GDS* is *Governance Disclosure Score* (from 0.1 to 100). *SDS* is *Social Disclosure Score* (from 0.1 to 100). *Crisis* is a dummy variable set to one in 2008 and 2009. *PostCrisis is a dummy variable set to one in 2010 to 2017*. *VT* is a binary variable (*Verification Type*) indicating whether an independent audit on CSR disclosures was led. *TGGE* is the total greenhouse gases emissions defined as the sum of total greenhouse gases emissions (methane, carbon dioxide, nitrous oxide, water vapor), in millions of metric ton. *CCP* is a binary variable (*Climate Change Policy*) indicating whether the company communicates on its effort to reduce its footprint and to improve its sustainability. *EEP* is a binary variable (*Emission Reduction Initiatives*) indicating whether the company has carried out actions to reduce its Greenhouse Gas Emissions. *GBP* is a binary variable (*Green Building Policy*) indicating whether the company has carried out policies in aiming at reducing its building's footprint. *EQM* is a binary variable (*Environment Quality Management*) indicating whether the company has carried out actions aiming at reducing its operations' footprint. *EEP* is a binary variable (*Energy Efficiency Policy*) indicating whether the company has carried out actions aiming at efficiently using energy.

(*GDS*) which is always beneficial to stock return, whether before, during or after the crisis.

We also notice that the governance dimension is more important during and after the crisis, than before it. For example, annual stock returns increase on average by 1.63p% more during the crisis than before it, when *GDS* increases by 1 point. The amplitude is slightly lower after the crisis, with a rise of 1.58p% in comparison to the pre-crisis period. Nevertheless, we do not observe such a positive association for the other four performance measures.

Table 4b gives more details about the eco-friendly policies implemented by the large US companies before, during, and after the crisis. Although the aggregated environmental dimension (*EDS*) was never significant in Model (5), we see that its division into seven categories is helpful in reaching more precise conclusions about its association with financial performance. Before the crisis, only two policies seem to matter. All else equal, we estimate that companies which carried out actions aiming at reducing its operations' footprint before the crisis ($EQM = 1$) had on average higher earnings per share by 0.41 dollars than those who did not ($EQM = 0$), with a p-value lower than 10%. Interestingly, the sign is for the second policy (*EEP*) is also positive and statistically significant at 5%: When companies carried out actions aiming at efficiently using energy before the crisis ($EEP = 1$), they were expected to show higher earnings per share by 0.99 dollars per share on average. We nevertheless have to stress that this association is not relevant for the other four measures of financial performance.

The only performance measure that is more sensitive to environmental policies during the crisis than before it, is the earnings per share through the efficient use of energy (*EEP*). Again, we find weak evidence supporting the hypothesis that the relation between financial performance and environmental performance is specific to periods of low trust. It might indicate that investors do not give extra value to companies which perform better in terms of environment protection in the middle of a crisis because they expect firms to focus more on short-term economic survival. Note that better environmental performance should not be considered as a waste of money neither, since there is no null hypothesis being rejected with a negative coefficient value.

On a somewhat more positive note, financial performance becomes more sensitive to environmental performance after the crisis than before it. It may indicate that investors wait for the crisis to end before discriminating between companies with poor and high environmental disclosure scores. After the crisis, investing in some specific environmental policies may be more financially rewarding than before. This is the case for the *Verification Type* variable, which is positively and significantly associated with financial performance in three cases out of five. We confirm the findings of Table 3 with respect to the importance of subjecting the company's environmental policies to an independent audit. For example, the ROA increases on average by 2.46p% more after the crisis than before the crisis when an independent audit is led, all else equal.

Finally, it seems that the “G” letter in ESG has become more financially important over time than the other two, at least with respect to stocks returns. In Table 4b, we see that the *GDS* variable is positive and statistically significant during and after the crisis, while it was insignificant before. This is not the case for the social dimension, which is even negative and statistically significant in the *EPS* equation.

5. Conclusion

Data on environmental performance remains scarce, especially before the year 2005. In spite of this, we have compared the nature of the relationship between environmental and financial performance before, during and after the crisis. The study focuses on a 13-year period. We have defined a pre-crisis period covering the years 2005 to 2007 and a post-crisis period going from 2010 to 2017. We could use annual data only, for the simple reason that these environmental data at the company level are not available at a higher frequency.

We find that the existence of emission reduction or climate change policies in large US companies does not seem to be broadly associated with better financial performance. Whether or not we condition the analysis on the occurrence of the 2008–2009 financial crisis, we do not observe clear-cut changes over time. Overall, we find weak evidence supporting the hypothesis that the relation between financial performance and environmental performance is specific to periods of low trust. In the middle of the crisis, investors may perceive these policies as useless in circumstances where firms would be expected to focus on economic survival exclusively.

There is nevertheless some glimmer of hope. When we zoom in on the different types of environmental policies implemented by large US publicly quoted firms, we find that financial performance is more responsive to the fact that some companies subject their environmental policies to an independent audit. Stock returns, the profit margin and the return on assets become more positively sensitive to this policy after the crisis than before it. In other words, investing in some specific environmental policies may therefore be more financially rewarding after the crisis than before it. We also find that the governance dimension is probably the most important dimension, at least if we consider stock returns as being the most insightful measure of financial performance. Also, governance responsibility influences financial performance to a larger extent during and after the crisis, than before it.

The way environmental performance is estimated, may also be subject to criticism. In our dataset, the use of binary variables is useful to identify the presence of green policies but it does not grasp the extent and the quality of such policies. Binary variables reduce the scope of interpretation and can denature the real link between environmental performance and financial performance.

In addition, the conclusions drawn from the model apply to large, publicly-quoted U.S. capitalization stocks only. These interpretations may not be generalized to other populations, such as small and medium-sized companies.

Last but not least, our analysis is exclusively quantitative. Additional insight could be gained by carrying out qualitative studies, based on interviews of various stakeholders to better understand how different environmental policies are perceived by investors in times of crisis and how these perceptions impact financial performance.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.eneco.2019.01.028.

References

Al-Tuwaijri, S.A., Christensen, T.E., Hughes II, K., 2004. The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equations approach. Acc. Organ. Soc. 29, 447–471.
Bansal, P., Jiang, G.F., Jung, J.C., 2015. Managing responsibly in tough economic times: strategic and tactical CSR during the 2008–2009 global recession. Long Range Plan. 48 (2), 69–79 (April).
Chetty, S., Naidoo, R., Seetharam, Y., 2015. The impact of corporate social responsibility on firms' financial performance in South Africa. Contemp. Econ. 9 (2), 193–214.
Croissant, Y., Millo, G., 2008. Panel data econometrics in R: the plm package. J. Stat. Softw. 27 (2), 1–43 (July).
Etsy, D.C., Lubin, D.A., 2010. The sustainability imperative. Harv. Bus. Rev. 88 (5), 42–50 (May).
Gallego-Álvarez, I., Segura, L., Martínez-Ferrero, J., 2015. Carbon emission reduction: the impact on the financial and operational performance of international companies. J. Clean. Prod. 103, 149–159.
Giannarakis, G., Theotokas, I., 2011. The effect of financial crisis in corporate social responsibility performance. Int. J. Mark. Stud. 3 (1), 2–10 (February).
Guiso, L., Sapienza, P., Zingales, L., 2008. Trusting the Stock Market. J. Financ. 63, 2557–2600.
Hart, S.L., Ahuja, G., 1996. Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance. Bus. Strateg. Environ. 5, 30–37.
Hirigoyen, G., Poulain-Rehm, T., 2015. Relationships between corporate social responsibility and financial performance: what is the causality? J. Bus. Manag. 4 (1), 18–43.
Ilinitch, A.Y., Soderstrom, N.S., Thomas, T.E., 1998. Measuring corporate environmental performance. J. Account. Public Policy 17, 383–408.

Jacob, C.K., 2012. The impact of financial crisis on corporate social responsibility and its implications for reputation risk management. J. Manag. Sustain. 2 (2), 259–275.
Karaibrahimoğlu, Y.Z., 2010. Corporate social responsibility in times of financial crisis. Afr. J. Bus. Manag. 2 (4), 382–389 (April).
Konar, S., Cohen, M.A., 2001. Does the market value environmental performance? Rev. Econ. Stat. 83 (2), 281–289 (May).
La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 1997. Trust in Large Organizations. Am. Econ. Rev. 87 (2), 333–338.
Lins, K.V., Servaes, H., Tamayo, A., 2017. Social capital, trust, and firm performance: the value of corporate social responsibility during the financial crisis. J. Financ. 73 (4), 1785–1824.
Njoroge, J., 2009. Effects of the Global Financial Crisis on Corporate Social Responsibility in Multinational Companies in Kenya. Africa Nazarene University (Kenya). Covalence Intern Analyst Papers, Geneva.
Pava, M.L., Krausz, J., 1996. The association between corporate social-responsibility and financial performance: the paradox of social cost. J. Bus. Ethics 15, 321–357.
Peloza, J., 2009. The challenge of measuring financial impacts from investments in corporate social performance. J. Manag. 35 (6), 1518–1541.
Selvi, Y., Wagner, E., Türel, A., 2010. Corporate social responsibility in the time of financial crisis: evidence from Turkey. Ann. Univ. Apulensis Ser. Oecon. 12 (1), 281–290.
Servaes, H., Tamayo, A., 2013. The Impact of Corporate Social Responsibility on Firm Value: The Role of Customer Awareness, Management Science. 59 (5), 1045–1061.
Simionescu, L., Dumitrescu, D., 2014. Corporate social responsibility and financial crisis. J. Public Adm. Finance Law (Special Issue 1), 31–37.
Simionescu, L., Gherghina, S., 2014. Corporate social responsibility and corporate performance: empirical evidence from a panel of the Bucharest Stock Exchange listed companies. Manag. Mark. 9 (4), 439–458 (Challenges for the Knowledge Society).
Souto, F., Fernández, B., 2009. Crisis and corporate social responsibility: threat or opportunity? Int. J. Econ. Sci. Appl. Res. 2 (1), 36–50.
Stanwick, P.A., Stanwick, S.D., 1998. The relationship between corporate social performance, and organizational size, financial performance, and environmental performance: an empirical examination. J. Bus. Ethics 17, 195–204.
Vandermerwe, S., Oliff, M.D., 1990. Customers drive corporations green. Long Range Plan. 23 (6), 10–16.